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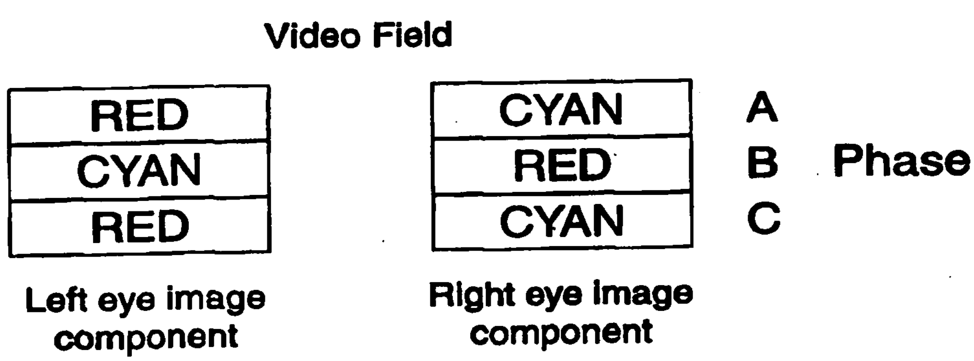

(57) Abstract

An apparatus for displaying a stereoscopic image, the apparatus having a predefined field frequency for displaying the image, and including a first filter means for passing a first perspective of an image with a first spectral component of a colour spectrum, a second filter means for passing a second perspective of the image with a second spectral component of the colour spectrum, and an alternating means for alternating the first and second spectral components, wherein the alternating means operates at a rate equal to an odd multiple of the field frequency of the display apparatus.

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METHOD AND APPARATUS FOR PRODUCING STEREOSCOPIC IMAGES

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for producing stereoscopic images, in particular a method of displaying stereoscopic images on a standard TV or Computer monitor without apparent flicker. In order to view the stereoscopic images the viewer wears a pair of glasses that substantially enable the full colour spectrum to be seen by each eye.

BACKGROUND OF THE INVENTION

In order for a viewer to see stereoscopic images it is necessary for the viewers eyes to view the subject matter from a slightly different perspective such that each eye sees a different view of the image. Several methods are currently used to display stereoscopic images on a TV or Computer monitor. The anaglyph system, as practiced in the current art, depends upon the use of complementary colour filters placed in front of each eye. For example a red transmitting filter may be used for the left eye, and a blue and green (cyan) transmitting filter used for the right eye. After each eye has become accustomed to the particular colour bias, and by displaying the left hand perspective of the subject in red and the right hand perspective in cyan, a reasonable stereoscopic image may be observed. However, because each eye is observing a very restricted portion of the full colour spectrum, only limited colour information can be added to what generally appears a lightly tinted picture.

A current technique is to produce on a TV or Computer monitor full colour images of the left and right perspective's alternately. The screen is viewed through spectacles which permit each eye to receive only the image of the appropriate perspective. The spectacles typically consist of Liquid Crystal elements that alternately "shutter" each eye, hence the generic term shutter glasses. The problem with this system is that when used at the standard field rate of 50Hz for PAL and 60Hz for NTSC television images, substantial flicker is produced because the image received by each eye alternates with periods of darkness. In order for this system to be acceptable to a viewer the image needs to be electronically processed to double the frame rate to a minimum of 100Hz.

At this speed the flicker is not noticeable. However, the video image is now no longer produced at a standard speed and can not be displayed on a normal TV or Computer monitor.

An alternative approach was proposed by Street in U.S. Pat. No 4,692,792 whereby at least two perspectives of an object field are displayed so that in use, the components of the colour spectrum used to display one perspective are, at a given instant, generally complementary to the components of the colour spectrum used to display another perspective whilst, averaged over a period of time, each said perspective is displayed using a generally representative set of components of the full spectrum of colour relative to the object field to be displayed stereoscopically. In effect this system transmits components of the colour spectrum corresponding to one perspective of an image at a given instant to one eye of a viewer and components of the colour spectrum corresponding to a second perspective of the image to the other eye of the viewer.

In practice Street's invention is not useable when the red/cyan transmission filters are switched at standard field rates of 50Hz for PAL and 60Hz for NTSC since substantial flicker of the image is observed at these switching rates. Further to switch at a different rate, for example 100Hz, would result in a rate which is non standard in relation to TV standards and would require special processing of the TV images, for example line doubling, as well as a special TV or Computer monitor. Additionally, the electromechanical nature of Street's spectacles means that they are not comfortable to wear for long periods due to their weight and the noise and vibrations felt by the viewer.

Further, it has been found that the system disclosed by Street also produces substantial peripheral flicker, in that the surroundings around the image appear to flicker. That is, because of the switching of the glasses, the background and other objects around the image appear to flicker. Such a flickering background has been found to be quite disconcerting to a viewer.

OBJECT OF THE INVENTION

An object of the invention is to provide a method and apparatus for producing a stereoscopic image in which the viewer is provided with a image

which may include a substantially full range of colour information for each eye substantially without flicker, and preferably when viewed on a standard, unmodified, PAL or NTSC TV or Computer monitor. Another object of the invention is to provide such an apparatus which may be produced in a fully electronic form rather than the electromechanical configurations of the prior art. Another object of the invention is to provide such an apparatus at relatively low cost.

SUMMARY OF THE INVENTION

With the above objects in mind the present invention provides in one aspect:

an apparatus for displaying a stereoscopic image, the apparatus having a predefined field frequency for displaying said image, and including:

a first filter means for passing a first perspective of an image with a first spectral component of a colour spectrum;

a second filter means for passing a second perspective of said image with a second spectral component of said colour spectrum;

an alternating means for alternating said first and second spectral components;

wherein said alternating means operates at a rate equal to an odd multiple of the field frequency of the display apparatus.

In a further aspect the present invention provides:

a method for displaying a stereoscopic image on a display apparatus having a predefined field frequency wherein:

a first perspective of an image to be viewed by a viewers left eye is passed through a first filter having a first spectral component of a colour spectrum;

a second perspective of an image to be viewed by a viewers right eye is passed through a second filter having a second spectral component of a colour spectrum;

and said first and second spectral components are caused to alternate at a rate equal to an odd multiple of the field frequency of the display apparatus.

Preferably, the present invention utilises first and second spectral

components that are complementary to each other. That is, a combination of the first and second spectral components would produce white light. Conveniently, the first spectral component may be red, and the second spectral component cyan, or a combination of blue and green. The present invention will be further discussed with reference to this red and cyan combination, however, any colour and its complement could also be used. For example, blue and yellow, or alternatively green and magenta, may also be used.

Preferably, the present invention also includes a synchronising means to ensure that a viewers left eye only sees the first perspective of the image, and that a viewers right eye only sees the second perspective of the image.

In yet a further aspect the present invention provides:

a system for viewing stereoscopic images including:

a filter means adapted to produce spectrally filtered left and right eye images for viewing by a viewers left and right eyes respectively;

a projection means for projecting or displaying said spectrally filtered left and right eye images on a display means having a predefined field frequency; and

a viewing means to enable a viewer to view said spectrally filtered left and right eye images on said display means;

wherein said filter means includes:

a first spectral filter means for filtering a left eye perspective of an image with a first spectral component of a colour spectrum;

a second spectral filter means for filtering a right eye perspective of said image with a second spectral component of said colour spectrum; and

an alternating means for alternating said first and second spectral components at a rate equal to an odd multiple of the field frequency of said display means.

Ideally, the invention is configured where by at least two perspectives of an object field are displayed so that in use, the components of the colour spectrum used to display one perspective are, at a given instant, generally complementary to the components of the colour spectrum used to display

another perspective whilst, averaged over a period of time, each said perspective is displayed using a generally representative set of components of the full spectrum of colour relative to the object field to be displayed stereoscopically. In effect this system transmits components of the colour spectrum corresponding to one perspective at a given instant to one eye of a viewer and components of the colour spectrum corresponding to a second perspective at that instant to the other eye of the viewer.

For example, a left-perspective view of an object in an object field and a right-perspective view may be displayed on a screen, with the right-perspective displayed in red and the left-perspective displayed in complementary cyan. Rapid switching between the two produces a substantially full spectrum of colour for each perspective.

It has been found in practice that switching between the red perspective and cyan perspective images at PAL and NTSC field rates causes a pronounced flicker to be observed. In order to overcome this flicker it has been found necessary to increase the switching rate to a minimum of 100Hz. At this speed, and above, the viewer is not aware of any flicker. However, since there are no TV video standards at this frequency or above it would be necessary to use some form of standards converter or line doubler to enable a practical, no flicker, implementation of this technique.

In order to switch at speeds of greater than 100Hz, and still maintain compatibility with existing PAL and NTSC standards, it has been found necessary to switch at odd multiples of the field frequency ie 150, 250Hz etc for PAL and 180, 300Hz etc for NTSC.

The present invention will be further described with reference to the accompanying drawings. It will be appreciated by the person skilled in the art that other embodiments of the present invention are possible, and therefore the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

Figure 1 demonstrates the complementary switching of the components of the colour spectrum for one field.

Figure 2 shows the progressive switching over two fields.

Figure 3 shows the relationship between the driving voltage and colour transmission of a Chiral Smectic (CS) LCD Cell.

Figure 4 shows a practical implementation of a stereoscopic viewing system using CS LCD Cells constructed as spectacles.

Figure 5 shows the stereoscopic video format required to drive a decoder of the present invention.

Figure 6 shows a possible configuration to enable a CS LCD cell to be driven at odd multiples of the field frequency.

Figure 7 shows a possible decoder for use with the present invention.

Figure 8a shows a possible switching means, in this case a multiplexer configured to transmit the red complement of the image to the left eye, and the cyan complement of the image to the right eye.

Figure 8b shows the next instance following Figure 8a, wherein the multiplexer is configured to transmit the cyan complement of the image to the left eye, and the red complement of the image to the right eye.

Figure 9a shows a typical frequency spectra of two complementary spectral components.

Figure 9b shows a graph of a notch filter to address the cross talk of two complementary spectral components.

Figure 9c shows a resultant frequency spectra of two complementary spectral components after application of a notch filter.

Referring now to the drawings, whilst the present invention could be combined with 2D to 3D conversion systems, it is primarily directed towards a system for receiving a 2D signal together with 3D data, whereby the 3D data enables a decoder to convert the 2D signal into respective left and right eye images for stereoscopic viewing by a viewer.

An example block diagram of a decoder in accordance with the present invention suitable for converting conventional analogue field sequential 3D, into a format suitable for use with colour sequential glasses is shown in Figure 7. The operation of this decoder is as follows:

Incoming video, which may be in composite or S-Video format is converted into 24bit RGB format using a video Analogue to Digital converter.

Alternate fields are stored in two 256k x 24bit field stores such that field store 1 contains odd fields and field store 2 contains even fields. The 24bit RGB outputs from each field store are selected by a triple 8bit multiplexer that, assuming Red/Cyan encoding has been used, selects the outputs as shown in Figure 8. That is, at one instance the red component of an image is directed towards the left eye, whilst the cyan component of the image is directed towards the right eye, as can be seen in Figure 8a. Then in the next instant the multiplexer switches such that the cyan component is fed to the left eye and the red component to the right eye, as can be seen in Figure 8b. The output from the multiplexer is fed into a video Digital to Analogue encoder, the resultant composite or S-Video output being displayed on a standard Television or computer monitor.

Other methods of constructing a decoder are possible, for example a 16bit YUV with a colour space conversion into and out of the triple 8bit multiplexer could also be used.

The timing generator can operate to switch the multiplexer at an odd multiple of the field rate, thereby enabling both eyes of the viewer to receive a substantially full colour spectrum and the image in 3D. That is, each eye views two spectral components of each field.

The choice and type of decoder is not important. What is required is that the decoder be able to receive and process the 2D image and 3D data, spectrally filter both the left and right eye images with two distinct spectral components, whilst effectively switching the spectral components at an odd multiple of the field frequency, such that the alternate filtering of both spectral components results in a substantially full colour stereoscopic image.

For example, consider a system of the present invention that switches at 150Hz, three times the PAL field rate of 50Hz, as illustrated in figure 1. The three phases of the first video field are indicated as A,B and C in figure 1. During phase A the red component of the left perspective view is presented to the left eye and the cyan component of the right perspective view to the right eye. During phase B the cyan component of the left perspective view is presented to the left eye and the red component of the right perspective view to

the right eye. During phase C the red component of the left perspective view is presented to the left eye and the cyan component of the right perspective view to the right eye. The three phases of the second video field are indicated in figure 2. During phase A the cyan component of the left perspective view is presented to the left eye and the red component of the right perspective view to the right eye. During phase B the red component of the left perspective view is presented to the left eye and the cyan component of the right perspective view to the right eye. During phase C the cyan component of the left perspective view is presented to the left eye and the red component of the right perspective view to the right eye. Thus during any phase each eye receives a spectral component of the colour spectrum of the perspective image. Over two adjacent phases eg AB, BC each eye receives substantially the full colour spectrum from its respective perspective view and since the switching rate is greater than 100Hz no flicker is evident.

Previous methods of providing spectacles that provide the necessary switching between red and cyan have relied on mechanical or electromechanical assemblies. A fully electronic, or electro-optic switchable colour filter will overcome all the problems associated with a viewer wearing spectacles having a mechanical or electromechanical components. Electro-optic switchable colour filters come in two basic varieties: birefringent colour filters and dichroic colour filters. Both types operate by linearly polarising light in a particular way that then allows the electro-optic means to manipulate those polarisations and transmit one colour at a time. The polarisation manipulation required entails either rotating the polarisation direction by 90° or leaving the direction unchanged. Both birefringent and dichroic filters were originally constructed with Kerr cells or Faraday rotators to control the polarisation, but today liquid crystal retarders provide the electro-optic function more conveniently.

New developments in Liquid Crystal Display (LCD) technologies have resulted in the development of a Chiral Smectic (CS) liquid crystal cell. This consists of a thin layer of liquid crystal sandwiched between two glass substrates. CS devices are switchable half-wave plates with a rotation angle of

45°. They are binary devices capable of switching between two orthogonal polarisation states. For an application of the present invention they may be constructed to switch between either red or cyan transmission. Transition times, between red and cyan, are small compared with the field flyback period of PAL and NTSC television standards. The cells are typically driven with bipolar +/- 5V DC balanced waveforms as illustrated in figure 3.

One basic practical implementation of a stereoscopic viewing system using CS LCD spectacles is illustrated in figure 4. It will be understood that other viewing devices may also be used, for example an alternative to the CS LCD spectacles would be Twisted Neumatic (TN) LCD spectacles.

Referring now to Figure 4 composite video, in PAL or NTSC format, is applied to a sync detector which outputs pulses at horizontal sync and a logic level indicating odd or even video fields. The horizontal sync pulse is used to clock a D-Type flip flop with the D input derived from the odd/even signal. The Q and -Q outputs from the D-Type flip flop provide the required complementary signal for directly driving the CS LCD cells. The stereoscopic video format required to drive this form of decoder is shown in figure 5. This is the most basic implementation and since the colour transitions take place at field frequencies, 50 or 60Hz, flicker is visible to the viewer.

In order to drive the CS LCD cell at odd multiples of the field frequency an enhanced configuration is required, one possible implementation is shown in figure 6. In this configuration a Phase Locked Loop, locked to an odd multiple of the horizontal sync signal is used to provide the higher frequency drive to the CS LCD cells.

At present the time taken for a CS LCD cell to switch between red and cyan is approximately 30 microseconds. This is a significant percentage of the scan time of a single line of PAL (64µS). Thus the transition from red to cyan or cyan to red will take approximately 1/2 scan line. It is thus likely that the viewer will notice this transition since it will occur twice per field (with 3 times field scan), and would effectively result in two horizontal lines being seen by the viewer extending across the screen.

Until faster transition CS LCD cells become available it is possible to

reduce the visibility of the transitions to the viewer by changing the video line number that the cell switches from red to cyan or cyan to red on each field. By varying the line number, and hence the physical position on the TV or Computer monitor screen, the colour transition will not be so noticeable to the viewer. That is, assuming that switching of the cell from one spectral component to the other spectral component for each frame would normally take place on line x. Then to reduce the transition effect, the line on which switching occurs for each frame can be varied to take place on one or more adjacent lines, for example lines x, x+1, x+2, ...x+n, may be used. Ideally, 5 to 10 different video lines can be used to switch the cell and thereby reduce the effect of the transitions. The video line numbers that the transitions take place on every field can be varied in a fixed sequence or on a pseudo random basis.

There are a number of techniques that can be used to synchronise the line number that the transition takes which would be obvious to anyone skilled in the art. One technique would be to insert a synchronising signal at the start of the first line of the video signal whenever the fixed or pseudo random sequence is required to restart.

It is expected that future developments to the CS LCD cell will result in faster switching times, or other material may become available that has faster switching times. If the transition time could be reduced to a few microseconds then the transition would occur in the horizontal blanking period and thus would not be seen by the viewer, in which case it would not be necessary to adjust the video line switching as described above.

In the preceding discussion, it has been assumed that the glasses allow only one of the two frequency spectrum to be seen at any time. That is, when passing frequency spectrum 1, spectrum 2 is entirely eliminated, and when passing frequency spectrum 2, frequency spectrum 1 is eliminated. However, in practice there is some crosstalk between the two frequency spectra particularly at the point where the two spectra intersect. This is illustrated in Figure 9a. The effect of this crosstalk is detrimental to the 3D images displayed and ideally should be removed. Whilst future colour cells may be available that have a steeper transition from pass to stop band, a present solution to the crosstalk is to

provide an optical notch filter in front of the cell to reduce or eliminate the spectra at the cross over point. It will be appreciated that various filters may be required dependent on the choice of frequency spectrum . For example, whilst a single notch filter may be sufficient for a red and cyan system, it is likely that two separate filters would be required in a green and magenta system.

It will also be understood that such filters may also be used to equalise the light amplitude of the two frequency spectra. That is, if the natural light amplitude of one spectral component differs from that of the other spectral component, then filters may be used to substantially equalise the two amplitudes, thereby providing the viewer with a more balanced image.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for displaying a stereoscopic image, the apparatus having a predefined field frequency for displaying said image, and including:

a first filter means for passing a first perspective of an image with a first spectral component of a colour spectrum;

a second filter means for passing a second perspective of said image with a second spectral component of said colour spectrum;

an alternating means for alternating said first and second spectral components;

wherein said alternating means operates at a rate equal to an odd multiple of the field frequency of the display apparatus.

2. An apparatus as claimed in claim 1 wherein said first and second spectral components are complementary to each other.

3. An apparatus as claimed in claim 1 or claim 2 further including:

a synchronising means to ensure that a viewers left eye only sees the first perspective of the image, and that a viewers right eye only sees the second perspective of the image.

4. An apparatus as claimed in any preceding claim wherein the first spectral component is red and the second spectral component cyan.

5. An apparatus as claimed in any one of claims 1 to 3 wherein the first spectral component is blue and the second spectral component yellow.

6. An apparatus as claimed in any one of claims 1 to 3 wherein the first spectral component is green and the second spectral component magenta.

7. An apparatus as claimed in any preceding claim wherein the field frequency is 50Hz.

8. An apparatus as claimed in any one of claims 1 to 6 wherein the field frequency is 60Hz.

9. An apparatus as claimed in any preceding claim further including:

a line control means for regulating on which video line switching from one spectral component to another spectral component occurs, wherein each successive image frame is switched on a different video line to the previous image frame.

10. An apparatus as claimed in claim 9 wherein switching occurs on any one of a plurality of adjacent video lines.

11. An apparatus as claimed in claim 9 or claim 10 wherein switching occurs on any one of 5 to 10 adjacent video lines.

12. An apparatus as claimed in any one of claims 9 to 11 wherein switching on adjacent video lines is regulated in a sequential order over successive image frames.

13. An apparatus as claimed in any one of claims 9 to 11 wherein switching on adjacent video lines is regulated in a pseudo random sequence over successive image frames.

14. A method for displaying a stereoscopic image on a display apparatus having a predefined field frequency wherein:

a first perspective of an image to be viewed by a viewers left eye is passed through a first filter having a first spectral component of a colour spectrum;

a second perspective of an image to be viewed by a viewers right eye is passed through a second filter having a second spectral component of a colour spectrum;

and said first and second spectral components are caused to alternate at a rate equal to an odd multiple of the field frequency of the display apparatus.

15. A method as claimed in claim 14 wherein said first and second spectral components are complementary to each other.

16. A method as claimed in claim 14 or claim 15 wherein the first spectral component is red and the second spectral component cyan.

17. A method as claimed in claim 14 or claim 15 wherein the first spectral component is blue and the second spectral component yellow.

18. A method as claimed in claim 14 or claim 15 wherein the first spectral component is green and the second spectral component magenta.

19. A method as claimed in any one of claims 14 to 18 wherein the field frequency is 50Hz.

20. A method as claimed in any one of claims 14 to 18 wherein the field frequency is 60Hz.

21. A method as claimed in any one of claims 14 to 20 wherein

switching from one spectral component to another spectral component on each image frame occurs on a different video line to the previous image frame.

22. A method as claimed in claim 21 wherein switching occurs on any one of a plurality of adjacent video lines.

23. A method as claimed in claim 21 or claim 22 wherein switching occurs on any one of 5 to 10 adjacent video lines.

24. A method as claimed in any one of claims 21 to 23 wherein switching on

adjacent video lines is regulated in a sequential order over successive image frames.

25. A method as claimed in any one of claims 21 to 23 wherein switching on adjacent video lines is regulated in a pseudo random sequence over successive image frames.

26. A system for viewing stereoscopic images including:

a filter means adapted to produce spectrally filtered left and right eye images for viewing by a viewers left and right eyes respectively;

a projection means for projecting or displaying said spectrally filtered left and right eye images on a display means having a predefined field frequency; and

a viewing means to enable a viewer to view said spectrally filtered left and right eye images on said display means;

wherein said filter means includes:

a first spectral filter means for filtering a left eye perspective of an image with a first spectral component of a colour spectrum;

a second spectral filter means for filtering a right eye perspective of said image with a second spectral component of said colour spectrum; ; and

an alternating means for alternating said first and second spectral components at a rate equal to an odd multiple of the field frequency of said display means.

27. A system as claimed in claim 26 wherein said second spectral component is complementary to said first spectral component.

28. A system as claimed in claim 26 or claim 27 further including:

a synchronising means to ensure that a viewers left eye only sees the left eye perspective of the spectrally filtered image, and that a viewers right eye only sees the right eye perspective of the spectrally filtered image.

29. A system as claimed in any one of claims 26 to 28 wherein the first component is red and the second component cyan.

30. A system as claimed in any one of claims 26 to 28 wherein the first component is blue and the second component yellow.

31. A system as claimed in any one of claims 26 to 28 wherein the first component is green and the second component magenta.

32. A system as claimed in any one of claims 26 to 31 wherein the field frequency is 50Hz.

33. A system as claimed in any one of claims 26 to 31 wherein the field frequency is 60Hz.

34. A system as claimed in any one of claims 26 to 33 wherein said viewing means includes:

a first spectral filter means corresponding to said first spectral component;

a second spectral filter means corresponding to said second spectral component;

an interchanging means for interchanging said first and second spectral filter means at a rate equal to said alternating means.

35. A system as claimed in any one of claims 26 to 34 further including:

a line control means for regulating on which video line of said display means switching from one spectral component to another spectral component occurs, wherein each successive image frame is switched on a different video line to the previous image frame.

36. A system as claimed in claim 35 wherein switching occurs on any one of a plurality of adjacent video lines.

37. A system as claimed in claim 35 or claim 36 wherein switching occurs on any one of 5 to 10 adjacent video lines.

38. A system as claimed in any one of claims 35 to 37 wherein switching on adjacent video lines is regulated in a sequential order over successive image frames.

39. A system as claimed in any one of claims 35 to 37 wherein switching on adjacent video lines is regulated in a pseudo random sequence over successive image frames.

Fig 1.

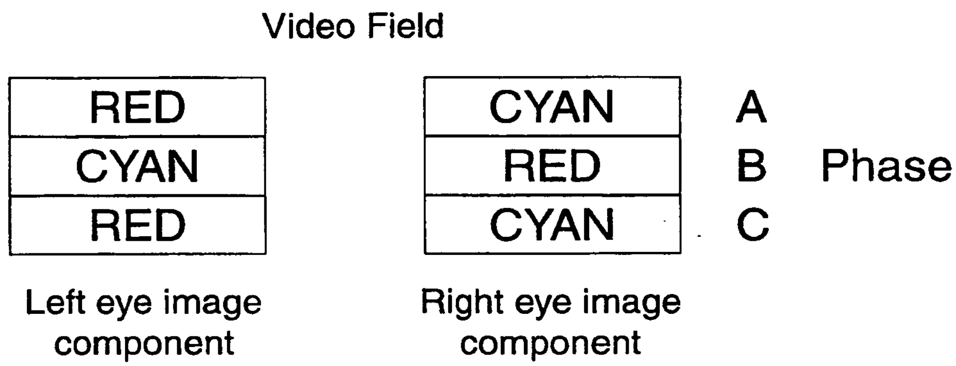

Video Field
RED
CYAN
RED
CYAN
RED
CYAN
A
B
C
Phase
Left eye image component
Right eye image component

Fig 2.

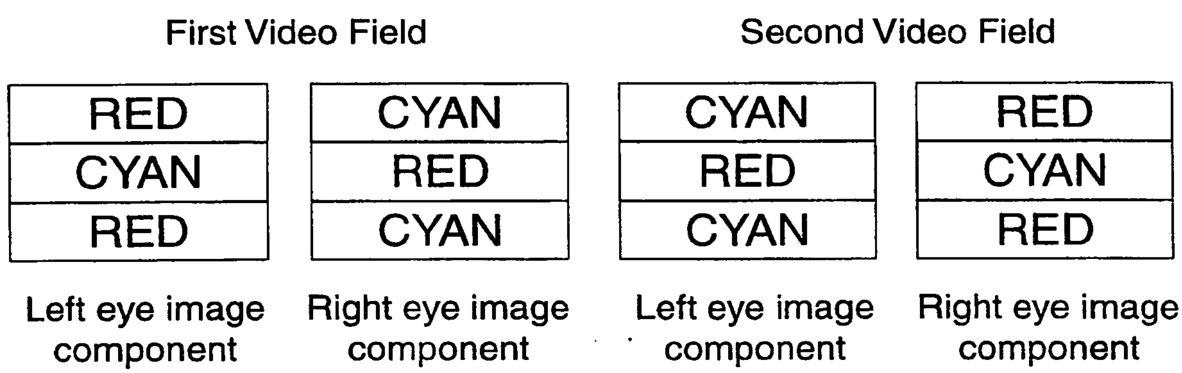

First Video Field
Second Video Field
RED
CYAN
RED
CYAN
RED
CYAN
CYAN
RED
CYAN
RED
CYAN
RED
Left eye image component
Right eye image component
Left eye image component
Right eye image component

Fig 3.

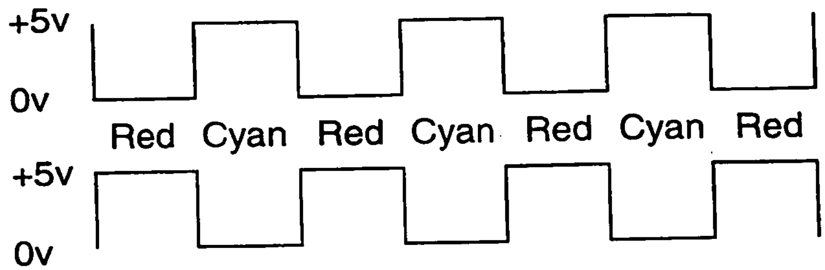


Fig 4.

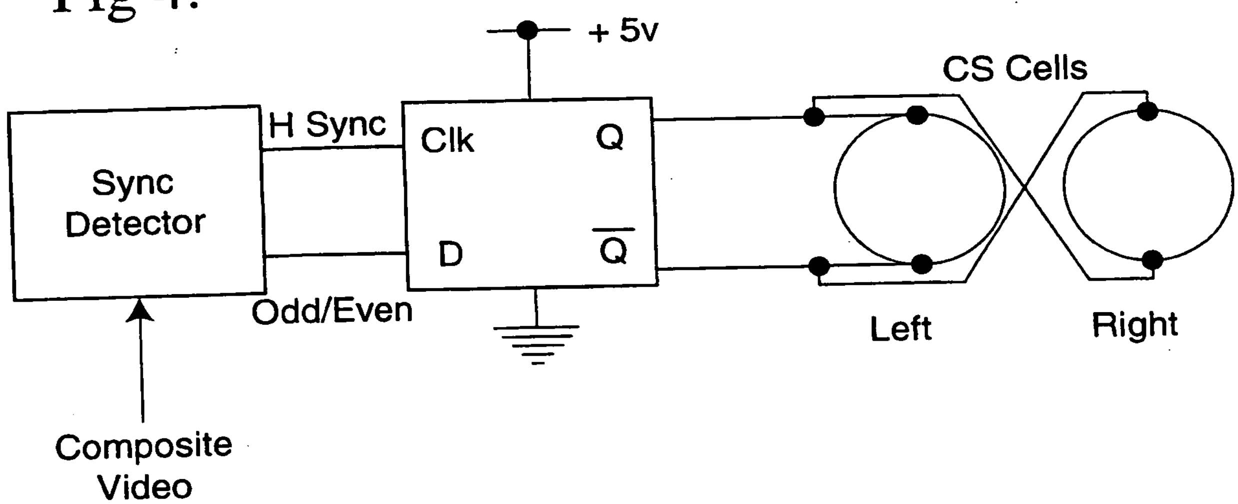
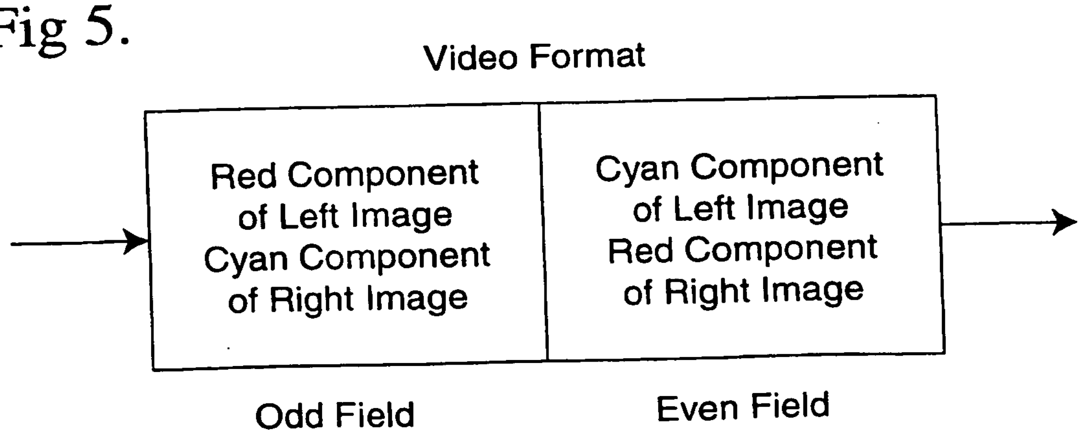


Fig 5.



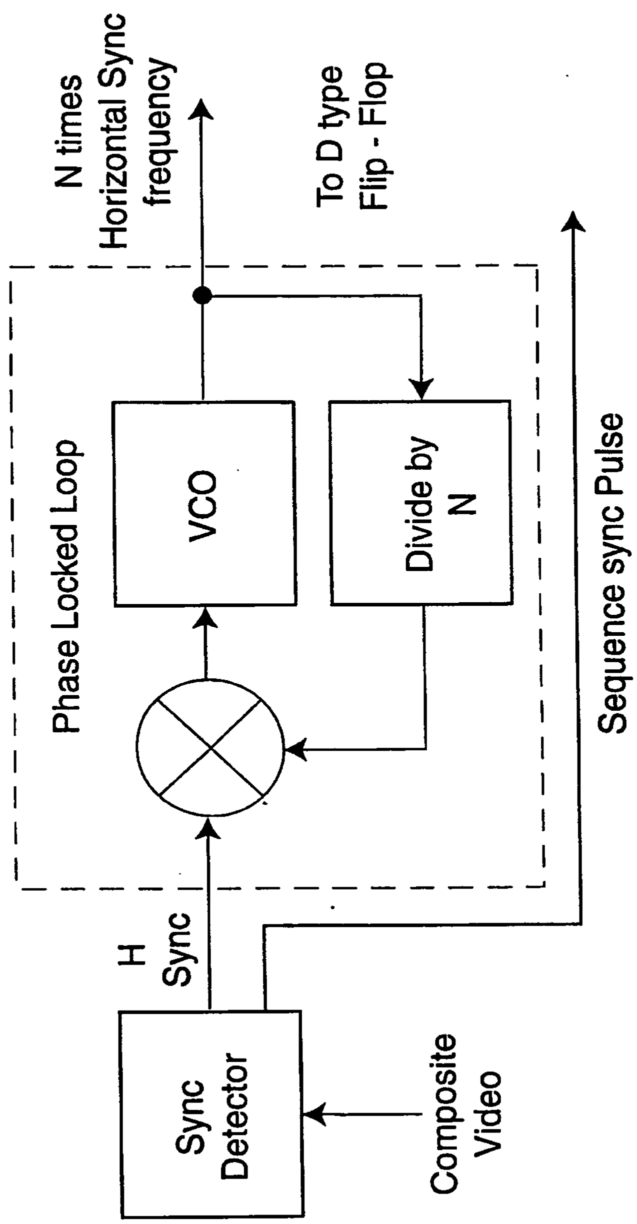

Sync
Detector
Composite
Video
H
Sync
Phase Locked Loop
VCO
Divide by
N
N times
Horizontal Sync
frequency
To D type
Flip - Flop
Sequence sync Pulse

Fig 6.

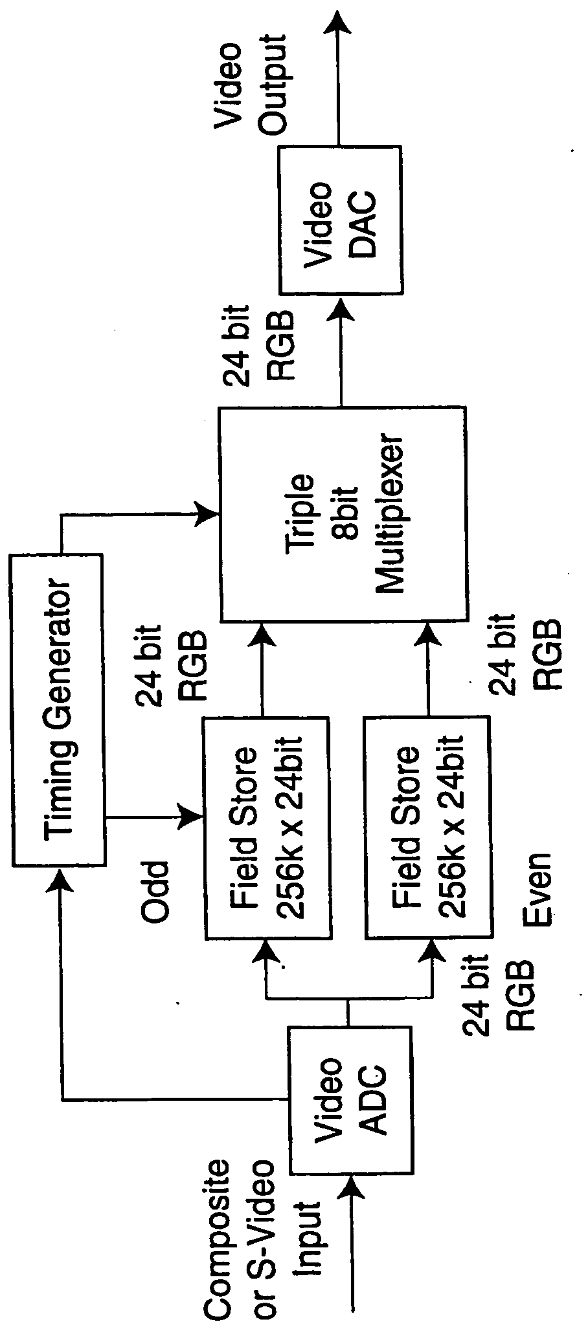

Video Output
Video DAC
24 bit RGB
Triple 8bit Multiplexer
Timing Generator
24 bit RGB
24 bit RGB
Odd
Field Store 256k x 24bit
Field Store 256k x 24bit
Even
24 bit RGB
Video ADC
Composite or S-Video Input

Fig 7.

Fig 8a.

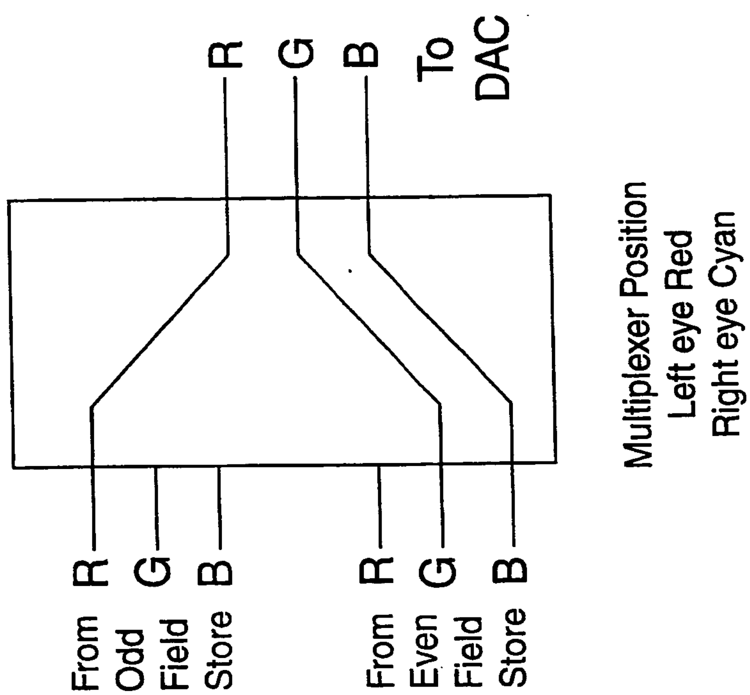

From Odd Field Store
R
G
B
From Even Field Store
R
G
B
R
G
B
To DAC
Multiplexer Position
Left eye Red
Right eye Cyan

Fig 8b.

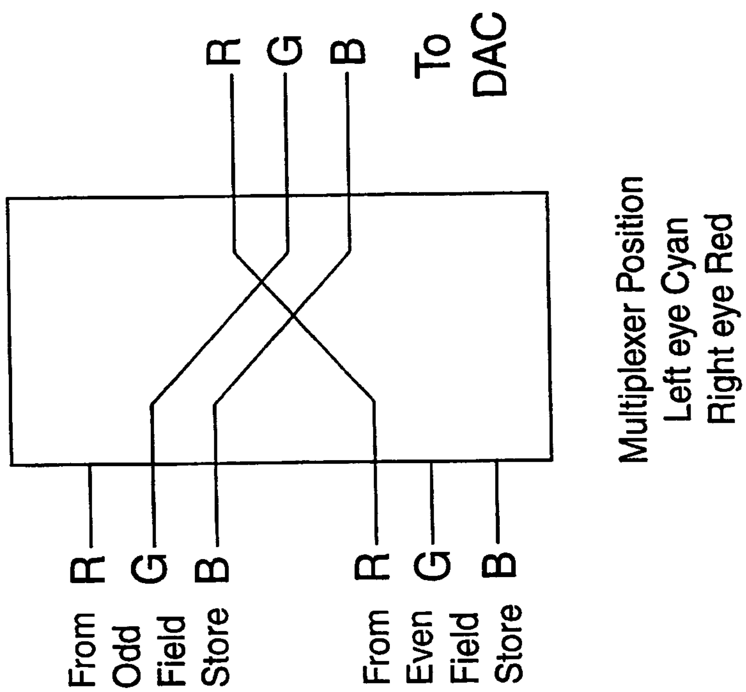

From Odd Field Store
R
G
B
From Even Field Store
R
G
B
R
G
B
To DAC
Multiplexer Position
Left eye Cyan
Right eye Red

Fig 9a.

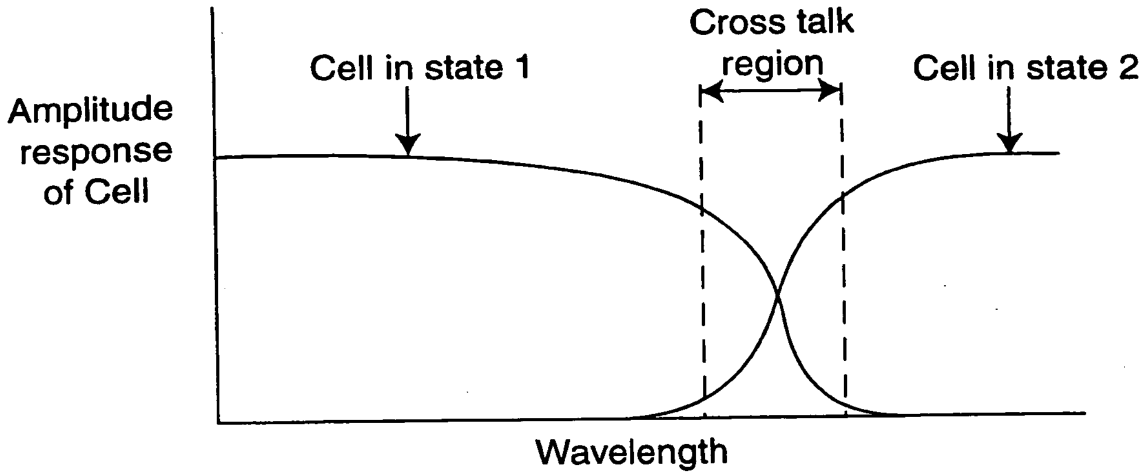


Fig 9b.

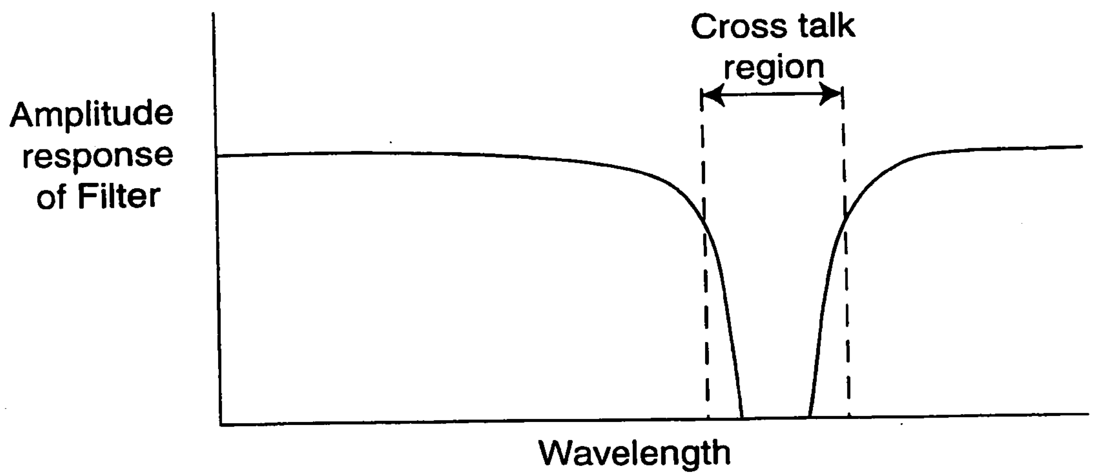
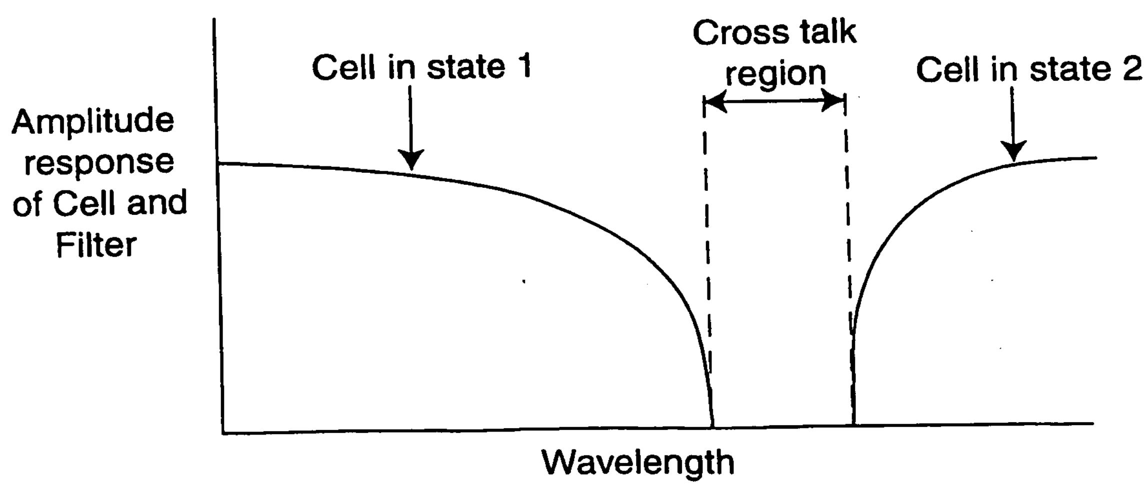


Fig 9c.



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00028

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl^6: H04N 15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC^6: as above

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU IPC^6: as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT (stereoscopic; image)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, A	WO 97/43681 (VREX, INC.) 20 November 1997 Abstract, pages 7-13, figures	1, 26
A	WO 95/15661 (Medi-Vision Tech. Inc.) 8 June 1995 Abstract, page 13, lines 14-30 figures	1, 26
A	WO 94/16353 (Honeywell Inc.) 21 July 1994 pages 1-4, figures	1, 26
A	US 5 260 773 (Dischert) 9 November 1993 whole document	1, 26

[X] Further documents are listed in the continuation of Box C

[ ] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 February 1998	25 FEB 1998

Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	DALE E. SIVER Telephone No.: (02) 6283 2196

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 98/00028

C (Continuation)	DOCUMENTS CONSIDERED TO BE RELEVANT	
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 541 374 (Ishii et al) 12 May 1993 Abstract, figures	1, 26
A	GB 2 255 251 (Ezra) 28 October 1992 whole document	1, 26
A	WO 92/11735 (Delta System Design) 9 July 1992 Abstract, figures	1, 26
A	FR 2 623 680 (Cahen) 26 May 1989 whole document	1, 26
A	EP 135 340 (Street) 27 March 1985 Abstract, claims	1, 26
	Note: In assigning category A to the cited documents it is assumed that the phrase 'an odd multiple" does <u>not</u> include 1 within it's scope. The specification page 5, lines 21-24 defines the phrase.	